REMARKS

Claims 1-28 are pending the above-referenced application. Claims 23-28 were withdrawn from consideration. Claims 1-7 and 9-16 are rejected and claims 8 and 17-22 are objected to. In addition, the drawings are objected to by the Examiner.

In particular and in accordance with the Item numbering of the Detailed Action, the Office Action has:

In Items 1 and 2, acknowledged the election of Group I (Claims 1-22) and withdrawn claims 23-28 from further consideration at this time.

In Item 3, objected to the drawings as failing to comply with Rule 84(p)(5) due to a missing callout.

In Item 4, objected to claim 13 as having an informality.

In Item 5, rejected claims 2-5, 7-15 and 18 under 35 U.S.C. §112 as failing to distinctly claim the subject matter applicant regards as the invention. In particular, with respect to claims 2, 3, 5, and 12, the Office action has alleged that variables "a", "b" and "c" are not explicitly defined in the claims. With respect to claims 4 and 5, the Office Action has argued that the recitation "the equation" has insufficient antecedent basis. In reference to claims 7 and 8, the Office Action has maintained that the phrase "computing the triangular area..." has insufficient antecedent basis. Regarding claims 9-15, the Office Action has alleged that the phrase "computing the maximum triangular area" has insufficient antecedent basis. Finally, with respect to claim 18, the Office Action has alleged that the limitation "wherein the step of computing the triangular area covered by said line segment..." has insufficient antecedent basis. Also, the Office Action has claimed that the variables "*p*" and "*sf*" are not defined in the claim.

In Item 6, rejected claims 1-5 and 16 under 35 U.S.C. §103(a) as being unpatentable over Brown (US 2003/0210251) in view of Kuchkuda (US Patent No. 5,872,902).

In Item 7, rejected claim 6 under 35 U.S.C. §103(a) as being unpatentable over Brown, Kuchkuda and further in view of Wade (US Patent No. 6,847,375).

In Item 8, rejected claim 7 under 35 U.S.C. §103(a) as being unpatentable over Brown, Kuchkuda, and further in view of Michail (US Patent No. 6,954,211).

In Item 9, indicated that claims 17 and 19-22 are allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In Item 10, indicated that claims 8-15 and 18 would be allowable if rewritten to overcome the rejections under 35 U.S.C. §112 2nd paragraph and to include all of the limitations of the base claim and any intervening claims.

Regarding Item 3, Applicants have corrected the description in paragraph [00013] to correctly refer to pixel 72 (instead of 82) in FIG. 2. Applicants thank the Examiner for pointing out the deficiency.

Regarding Item 4, Applicants have corrected the informality by deleting the extra word and thank the Examiner for finding the error.

Regarding Item 5, Applicants have amended claims 2, 3, 5 and 12, so that parameters "a", "b" and "c" are explicitly defined. In reference to claims 4 and 5, Applicants have amended claim 4 to set forth an antecedent for the phrase "the equation." With respect to claims 7 and 8, Applicants have amended claim 7 to set forth an antecedent for "the triangular area." In reference to claims 9-15, Applicants have amended claim 9 to set forth an antecedent for the limitation "maximum triangular area." With respect to claim 18, Applicants have amended the claim to remove the inconsistency pointed out by the Examiner and to define the variables *sf* and *p* explicitly. Applicants believe that the concerns raised by the Examiner have been addressed.

ITEM 6

Regarding Item 6, Applicants respectfully submit that the combination of Brown and Kuchkuda fails to teach or suggest all of the limitations of claim 1 at least because the combination fails to teach the limitation "expanding an edge of the line segment touching but not covering a pixel center of the line segment to be rendered on the output device so that the expanded line segment covers the center of the pixel touched." While it

is true that Brown expands the line segment, the criterion for expansion is different from the claim limitation. The criterion for expansion of the line segment in Brown is that of the quality of the resulting image as measured by a column sum metric. Brown, paragraphs 0034, 0043 and 0045. The expansion in Brown is not concerned with expanding only to the center of a pixel that is touched by the unexpanded line. Accordingly, the formulas for the expansion of the line in Brown are different from the claimed invention, because the formulas reflect the different criteria. In Brown, the expansion is given by $\frac{w}{2}\left(\frac{1}{\sin\theta+\cos\theta}\right)+\frac{1}{2}=\frac{1}{2m}\left(\frac{w\cdot sf}{\cos\theta}\right)+\frac{1}{2}$[1], whereas in the present invention it is given by $\frac{b}{2a}+\frac{1}{2}=\frac{1}{2m}+\frac{1}{2}$. Thus, Applicants respectfully submit that the limitation "expanding an edge of the line segment touching but not covering a pixel center of the line segment to be rendered on the output device so that the expanded line segment covers the center of the pixel touched," recited in claim 1 is not met because Brown never describes the specific criteria recited, i.e., that the line be expanded to the center of the pixel touched.

The Office Action has alleged that the expansion of the line in Brown is functionally equivalent to Applicants' expanding an edge of the line segment, since the expanded rectangle of Brown covers pixel centers which were previously not included in the drawing of the line segment. However, this statement of functional equivalence is too broad. It would encompass any expansion of the line segment. If the line segment were expanded by a factor of 3, say, the expanded rectangle would cover pixels centers not previously included. Applicants respectfully submit that the expansion in Applicants' invention which occurs numerically according to $\frac{1}{2m}+\frac{1}{2}$ is qualitatively different from the expansion in Brown which occurs numerically according to $\frac{1}{2m}\left(\frac{w\cdot sf}{\cos\theta}\right)+\frac{1}{2}$. These formulas are not functional equivalents. If they were functional equivalents, both types of line expansions would have the same formula.

[1] Applicants have expressed the formula in Brown in terms of the parameters defined in Applicants' specfication to make the comparison easier.

Furthermore, Applicants submit that Brown fails to meet the limitation "for each pixel that is included in said non-zero thickness expanded line segment...based on the area of the pixel covered, determining a shading value for the pixel by interpolating between the shade of said line segment and the shade of the background," as recited in claim 1, because Brown fails to describe anything about interpolating between the shade of the line and the shade of the background. The Office Action has acknowledged this fact, but cites Kuchkuda as teaching this element. However, Applicants respectfully submit that Kuchkuda does not teach the limitation "for each pixel that is included in said non-zero thickness expanded line segment...based on the area of the pixel covered, determining a shading value for the pixel by interpolating between the shade of said line segment and the shade of the background," based on the following.

The Kuchkuda reference describes a rendering procedure that is divided into three tasks. First pixels covered by primitive polygons are identified. Next, R, G, B, Z, T and U and V values are determined for each of the identified pixels. Third, the pixels from the second task are combined with pixels from previously rendered primitives. Kuchkuda '902, Col. 7, line 61 to Col. 8, line 3. More specifically, in the third step, the pixels from the second step are blended with those of other primitives by use of a linked list like a Z-buffer. Kuchkuda, '902, Col. 8, lines 25-27. The reference further describes the concept of pixlinks in reference to the third step. A pixlink is defined as a value generated by the dicer. Each of these so-called pixlinks is linked to a vector of X, Y, Z, R, G, B and A values and may cover part or all of a pixel. In fact, several pixlinks may contribute to a single pixel. Kuchkuda, '902, Col. 9, lines 17-28. Apparently, pixlinks are blended into the frame buffer. Kuchkuda, '902, Col. 9, lines 29-30. This blending means that, based on z-buffer values, a top pixlink color is blended with an underlying pixlink color. Kuchkuda, '902, Col. 9, lines 40-43.

Applicants respectfully submit that the blending of the present invention is not the blending described in Kuchkuda. Applicants are not blending over multiple primitives which may have different depth values. Applicants are simply blending between the shade of said line segment and the shade of the background, based on the area of the pixel covered. If the pixel is 100% covered by the line, then it gets the shade of the line segment. If the pixel is 50% covered by the line, then it gets 50% of the shade of the line

and 50% of the shade of the background. This blending is between the pixel and the background, not between pixels that have multiple primitives lying over them, which is a completely separate issue. The Office Action has alleged that the blending of pixlink values in Kuchkuda and the interpolation recited in claim 1 are functionally equivalent. Applicants respectfully disagree. The blending of pixlink values in Kuchkuda is a separate and distinct problem from the blending of a pixel with the background. In Kuchkuda, even if there is blending of pixlink values, a blending between the final pixlink value and the background could still be performed, but no such final blending is mentioned in Kuchkuda. Therefore, Applicants believe that Kuchkuda fails to teach this aspect of the present invention and thus the combination of Brown and Kuchkuda fails to teach or suggest all of the limitations of claim 1.

In regard to claim 2, the Office Action has alleged that the proposed combination of Brown and Kuchkuda disclose all of the limitations of claim 2. With respect to claim 2, Applicants submit that the limitations therein are not taught or suggested by the combination at least because the combination fails to teach each and every limitation of claim 1, from which 2 depends. Additionally, the proposed combination fails to teach the limitation "wherein the step of expanding an edge includes moving the edge of said line segment by an amount equal to (a+b)/2a in the x-direction to include the center of a pixel that has a corner traversed by an edge of said line segment, wherein a is greater than zero and b is greater than or equal to zero," as recited therein. The amount of expansion (a+b)/2a leads to the modification to the edge equation $\frac{1}{2m}+\frac{1}{2}$, as described above. This is not the same as the formula $\frac{w}{2}+\frac{1}{2}$ in Brown at paragraph 0031, cited by the Examiner. Applicants' extension formula includes the slope m and does not include the line width, w. The formulas are not functionally equivalent and there is no hint in Brown that one should take a = 1 and b = w, as the Office Action suggests. In fact, this is tantamount to equating the width of the line with the reciprocal of its slope. No person of skill in the art would make such an equivalence. Applicants would like to understand the source of the motivation to make such an equivalence.

With respect to claim 3, Applicants submit that the limitations therein are not

taught or suggested by the combination at least because the combination fails to teach each and every limitation of claim 1, from which 3 depends. Furthermore, Applicants respectfully submit that the limitation "wherein the step of expanding an edge includes altering the equation of an edge of said line segment by adding an amount (|a|+|b|)/2 to the c parameter of the equation," is not taught or suggested by the proposed combination. As explained above, the modification to the edge equation is $\frac{1}{2m}+\frac{1}{2}$, which is not taught or suggested in Brown.

With respect to claim 4, Applicants submit that the limitations therein are not taught or suggested by the combination at least because the combination fails to teach each and every limitation of claim 1, from which 4 depends.

With reference to claim 5, Applicants submit that the limitations therein are not taught or suggested by the combination at least because the combination fails to teach each and every limitation of claim 4, from which 5 depends.

In regard to claim 16, Applicants submit that the limitations therein are not taught or suggested by the combination at least because the combination fails to teach each and every limitation of claim 1, from which 16 depends. Additionally, the Kuchkuda reference fails to teach the limitation "computing the difference between unity and the triangular area not covered to find the area of the pixel covered," as recited therein. There is no hint or suggestion in Kuchkuda to subtract a triangular area not covered from unity, as recited in claim 16. Furthermore, there is no teaching in Kuchkuda regarding the limitation "determining that the area covered is greater than a second predetermined limit, leaving a triangular area not covered." There is no indication in the Kuchkuda reference that such a predetermined limit is important in the calculations. Therefore, the proposed combination fails to teach all of the limitations of claim 16.

ITEM 7

With respect to claim 6, the Office Action has rejected claim 6 as being unpatentable based on the proposed combination of Brown and Kuchkuda and in addition Wada, Applicants submit that claim 6 is allowable over the combination because claim 1, from which claim 6 depends, is allowable over the combination.

ITEM 8

With respect to claim 7, the Office Action has rejected claim 7 as being unpatentable over the proposed combination of Brown, Kuchkuda, Wada, and in addition Michail. The latter reference describes the subdivision of a graphics primitive using scanline-aligned lines, the subdivision ultimately creating simple scanline-boundaried trapezoids and other complex scan shapes. Michail '211, Col. 5, line 64 - Col. 6, line 49. Applicants respectfully submit that the limitation "wherein, *for an edge of said line segment that traverses a partially covered pixel so as to define a triangular area*, the step of determining the area of a partially covered pixel includes: determining that the area covered is less than or equal to a first predetermined limit; and computing the triangular area covered by said line segment," recited in claim 7, is different from what is described in Michail. In the Applicants' invention, the edge of the line segment defines the triangular area. In the reference the *scan line* defines the trapezoidal area. Applicants are not using scan lines to define the area covered by a pixel, and Applicants' limitation makes this clear.

The reference further describes that the non-scan aligned boundaries of the simple trapezoids must be rasterized. Michail '211, Col. 8, lines 2-4. To render these boundaries, a width of the edge area is defined, as shown in FIG. 8 of Michail. This width is described as $width = 1 + |1/slope|$. The Office Action has identified this width with the parameter p recited in Applicants' claim 7. However, Applicants have defined p as $\frac{m\Delta x}{m+1}$. Applicants fail to see how an arbitrary line width in the Michail reference is in any way related to the parameter p used in Applicants' formulas. The parameter p is not functionally equivalent to the width of the edge in Michail, a width that appears rather arbitrary. Furthermore, the width of the edge referred to Michail is not the area of the triangles identified as 910 and 912 in FIG. 9 and no calculation is disclosed in the Michail reference for the area. In addition, Applicants' submit that the combination of Michail and Brown is not a combination that one of skill in the art would make. Brown describes an edge-expansion method (different from the present invention) to perform anti-aliasing and Michail describes a scan line method. Applicants submit that the two

techniques are in conflict with each other such that one of skill in the art cognizant of Brown would not seek out Michail for aid in implementing anti-aliasing. Therefore, Applicants submit that there would have been no motivation to combine the teachings of Michail with those of Brown.

ITEM 9

The Office Action has objected to claim 17 and 19-22, but stated that these claims would be allowable if rewritten in independent form, including any intervening limitations. Applicants respectfully submit that these claims are allowable in their current form at least because claim 1 from which they depend is believed to be allowable. Additionally, the claims are allowable for the reasons the Examiner has indicated.

ITEM 10

With respect to claim 8, Applicants believe that the claim is allowable in present form at least because the reference fails to teach the limitations of amended claim 7, from which claim 8 depends. Additionally, claim 8 is allowable because the references fail to teach the limitation "wherein the step of computing the triangular area covered by said line segment includes forming a product $\frac{1}{2} * p^2 * (1\text{-}sf)^{-1} * sf^{1}$ to find the area," as the Office Action has admitted.

In regard to claim 9, Applicants believe that the claim is allowable in present form at least because the reference fails to teach the limitations of claim 1 from which claim 9 depends. Additionally, the references fail to teach the limitations "wherein, for an edge of said line segment that traverses a partially covered pixel so as to define a maximum triangular area and a parallelogram area , the step of determining the area of a partially covered pixel includes: determining that the area covered is greater than a first predetermined limit; computing the maximum triangular area covered by said line segment; computing the area of a parallelogram covered by said line segment; and computing the sum of the maximum triangular area and the parallelogram area," as noted in the Office Action.

In regard to claims 10-15, Applicants believe that these claims are allowable at least because amended claim 9, from which they ultimately depend is allowable.

In reference to claim 18, Applicants believe that claim 18 is allowable at least because claim 16, from which it depends, is allowable. Additionally, the references fail to teach the limitation "wherein the step of computing the triangular not area covered by said line segment includes forming a product $\frac{1}{2} * p^2 * (1-sf)^{-1} * sf^1$ to find the triangular area not covered," as now recited in claim 18.

CONCLUSION

Having addressed each and every ground of objection and rejection, applicants believe that the application is in condition for allowance. Applicants respectfully request reconsideration and allowance of the pending claims in the above-mentioned application and respectfully request that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

Dated: March 13, 2006

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CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that this correspondence is being forwarded via facsimile to Examiner Antonio Caehera in Group No. 2676 at facsimile number 571.273.8300 located at Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA, 22313-1450, on

Date: March 13, 2006

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